

Feeding and foraging behaviour of alpaca in northern Chile

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(Received 21 June 1991, accepted 23 September 1991)

Alpaca play a primary role in the Andean peasant economy. Major constraints to productivity include lack of knowledge of relations between reproduction and nutrition and of the potential of alpaca outside their normal distribution area. Alpaca are being studied in their native Andean environment and under extensive and intensive management systems in central Chile. Feeding behaviour and distances travelled were observed in an experiment including 25 animals (10 at altitude, 10 in central Chile on extensive grazing and five in confinement). Pedometers were used to determine distances travelled and feeding activity was measured by a specially designed apparatus. Alpacas on the high plateau spent more energy, as shown by increased grazing time and distance covered, and weighted the lowest of the three groups.

Introduction

The alpaca is one of two species of domestic camelids endemic to the Andean region. The economic importance of the camelids is based on fibre and meat production, these products being the main source of income, food and clothing for the people inhabiting this depressed area. At present, 80% of Andean alpacas are managed traditionally in small or medium sized flocks on communal lands.

Increasing populations of wild and domestic animals and decreasing nutritional resources in the natural distribution area are inhibiting alpaca production in Chile. The fertility rate is very low and varies from 40 to 60% (de Carolis, 1987). Early embryonic loss, amounting to approximately 50% of implanted foetuses, occurs in the first 30 days of gestation, particularly at the time that the embryo migrates from one uterine horn to the other (Sumar, 1983). Other factors that contribute to low fertility are associated with the poor nutrition, the extremely harsh climatic conditions with rapid diurnal/nocturnal changes in ambient temperature, and infectious and parasitic diseases. Possible high levels of inbreeding due to small flock sizes might also contribute to the low reproductive rate.

Little is known of the relations between reproduction and nutrition in alpaca, although there are many studies on the former but only few on the latter subject. Minimal research has been carried out on grazing behaviour, feed selection and nutritional composition of plants selected by alpaca (Pfister *et al.*, 1989; San Martin & Bryant, 1989). The Andes have two well-defined seasons: a rainy season from November to April, with highest precipitation in January; and a dry season from May to October. The rainy season is in summer and at this time the grassland is in the best condition. The dry season is in winter and is characterized by low temperatures: feed conditions are poor in terms of quantity and quality. The dry season is critical to some reproductive events, including the end of gestation, late lactation and weaning.

In recent years, an increasing interest in raising alpaca, due principally to the characteristics of its fibre, has been shown by producers in regions of Chile other than the High Andes. One of these regions is the central zone, with a milder climate and a higher animal carrying capacity. Better nutrition in this zone, coupled with better management by progressive farmers, could lead to higher fertility and overall reproductive performance and increased fibre production.

The purpose of the present study is to obtain information on the grazing behaviour and productivity of alpaca in two different regions of Chile, one located in the Andean high plateau and the other in the central zone of the country, with a view to verifying some of these hypotheses.

Materials and methods

Study areas

The study was undertaken in two areas; one near the village of Parinacota in Lauca National Park (18°10'S, 69°27'W), the climate and other general features of which have already been described (Urquieta *et al.*, 1994) and the second in the central zone (600 m altitude; 33°S, 70°W).

Animals

A feeding behaviour study was done in July (the austral winter) with 25 adult Huacaya alpacas (Fig. 1). A group of 10 animals was followed in Aymara Indian traditionally managed flocks in Lauca Park. A second group of 10 was extensively managed and a further five animals intensively managed, both in the central zone. All animals were in



Figure 1. A male alpaca of the Huacaya breed with 1 year's fibre growth (Photograph: R. T. Wilson).

sound condition. A treatment to control internal parasites was given 2 weeks prior to the start of the study.

Observations

All animals were weighed at the beginning and end of the trials. Each animal was followed for at least 3 consecutive days to study feeding and foraging behaviour and in order to detect individual variation.

In the high plateau and central zone extensive groups, pedometers were used to determine the distance walked in a 9-h period, from 0900 to 1800 h. The instruments were calibrated separately for each animal and were attached in the right scapula zone: the number of steps were counted and automatically converted to km.

In the study of actual feeding time a specially designed piece of equipment was used. This comprised an electronic device that senses the differences in neck and head angles and measures and records the time that animals have their heads lowered (Raggi *et al.*, 1990).

The selection of forage species was determined by observation of the animals while eating. Samples of the selected plants were collected for identification, classification and analysis of nutritional composition. The group under intensive management was fed lucerne hay, in order to measure, in controlled conditions, food and water intake in the diurnal and nocturnal periods. In this group, time spent feeding by the animals and the preferences for selection of leaves or stems were also measured.

Results and discussion

Mean weights at the end of the experimental period differed between animals under extensive traditional management and those fed intensively (Table 1). Animals under extensive management in the central zone were intermediate in weight between the other groups and did not differ significantly from either.

The distance walked by animals during the feeding period was significantly more in Lauca Park in the traditional system than under extensive management in the central zone (Table 1): these differences in distance covered are probably due to different vegetation characteristics. On the plateau, range productivity is poor and the vegetation is dominated by species of low value (de Carolis, 1987). The quantity and quality of forage has decreased over recent years; this is due to a combination of lower rainfall and an increase in the length of the dry period, associated with an increase in the numbers of both wild and domestic animals competing in the use of the same environment.

Time spent feeding varied in a manner similar to that observed for distance covered. The high plateau group fed for the longest time (Table 1), this being equivalent to 79.3%

Table 1. Average weights, distances walked and time spent feeding by three groups of alpaca in Chile

Group	Weight (kg)			Distance (km)			Grazing time (h)		
	<i>n</i>	Mean	± S.D.	<i>n</i>	Mean	± S.D.	<i>n</i>	Mean	± S.D.
High plateau	10	48.0	6.9 _a	10	3.2	0.5 _a	30	6.3	0.8 _a
Central zone	10	52.4	8.1 _{ab}	10	1.1	0.1 _b	30	5.1	0.5 _b
Intensive system	5	58.8	7.7 _b	—	—	—	30	2.6	0.8 _c

Within columns, values without a common suffix differ ($p < 0.05$).

Table 2. *Feed and water intake of Chilean alpacas under intensive management*

Period	Feed intake		Water intake
	g dry matter ⁻¹ day ⁻¹	g dry matter ⁻¹ kg LW ⁻¹	l day ⁻¹
24 hours	1345	23.0	2.9
Diurnal period	748	12.7	2.0
Nocturnal period	597	10.3	0.9

LW, live weight.

of total time out on pasture. In the central zone, 63.3% of total time out was spent feeding. In the intensive system, 32.7% of the total time was spent feeding over a 24-h period.

Feeding time differed ($p < 0.05$) for all three groups. These results agree with those reported for similar conditions in Perú (Rios *et al.*, 1984; San Martin & Bryant, 1989) where free-ranging alpaca at altitude spent 72–75% of the grazing period on feeding. As the proportion of feeding time increased, that devoted to other activities decreased and animals in the high altitude conditions of Lauca Park showed shorter total times ruminating and resting during the day than did animals in the central zone groups.

The type of feed species selected varied and was mainly due to differences in botanical composition of the vegetation in the two environments. In the Andes the plant species selected were *Oxichloe andina*, *Festuca ortophylla*, *Deuxeria breviastata* and *Azolla filiculoides*. In the central zone plants most commonly eaten were *Erodium moschatum*, *Rubus ulmiflorus*, *Trifolium* spp., *Poa annua* and *Maytenus boaria*.

Daily hay intake in the intensive group corresponded to 23 g dry matter⁻¹ kg⁻¹ live weight while total water intake was 2.9 l (Table 2). There were variations in both feed and water intake between day and night. Total consumption in the intensive group was equivalent to a daily digestible energy intake of 16.50 Mjoules, equivalent to 13.37 Mjoules metabolizable energy, and 262.2 g of crude protein. Proportional selection of the lucerne hay was 77.3% leaves and 22.7% stems. The intake figures are similar to those reported earlier for animals under intensive conditions in Perú (San Martin *et al.*, 1985; Clavo & Perez, 1988).

Conclusions

These preliminary results have shown that alpaca living at altitude need to spend more time — and presumably energy — in fulfilling their nutritional requirements than do animals in less severe climatic and feed conditions. In addition they are at a disadvantage in terms of weight in spite of the greater effort expended. Investigations of the effects of this energy expenditure and the lower nutritional quality of the high altitude prairie on reproductive performance will form the next phase of the research programme.

This study was supported by FAO/IAEA projects TCP CHI/5/013 and 6300/RB, and by Fondo Nacional de Desarrollo de Ciencia y Tecnología P.0794/89. The authors are indebted to the Comisión Nacional Forestal (CONAF) for facilities in Lauca National Park and for administrative support. This research could not have been done without the active cooperation of the Aymara peasant community of Parinacota village in Lauca National Park, in whose interest it has been carried out.

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